

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
ACTING AS RECEIVING OFFICE FOR THE PCT

In re Application of:	§	Attorney Docket No.: Muller-26
Klaus Kwetkat and Gerd H. Dahms	§	
Int'l. Appln. No.: PCT/DE00/03163	§	
Int'l. Filing Date: 13 September 2000	§	
Priority Date: 13 September 1999	§	Art Unit No.: To Be Assigned
U.S. Serial No.: 09/831,797	§	
U.S. Filing Date: May 14, 2001	§	
For: <i>Tenside Composition Containing Gemini Tensides and Use Thereof for Cleaning Skin and Hair</i>	§	
	§	Examiner: To Be Assigned

**RESPONSE TO NOTIFICATION OF MISSING REQUIREMENTS  
UNDER 35 U.S.C. §371 IN THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)**

Box PCT  
Assistant Commissioner for Patents  
Washington, D.C. 20231  
Attn.: DO/EO/US

Sir:

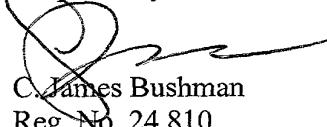
Responsive to the Notification of Missing Requirements mailed June 18, 2001, enclosed herewith for filing in the above-identified application is a Declaration and Power of Attorney, along with the required surcharge of \$130.00 and a copy of the Notification of Missing Requirements.

08/17/2001 UEDUWJE 00000048 09831797

01 FC:154

130.00 DP

Respectfully submitted,

  
C. James Bushman  
Reg. No. 24,810

Date: 8/14/01  
Browning Bushman  
5718 Westheimer, Suite 1800  
Houston, TX 77057  
Tel.: (713) 266-5593  
Fax: (713) 266-5169

**CERTIFICATE OF EXPRESS MAILING**

I, Jan C. Lipscomb, hereby certify that this correspondence and all referenced enclosures are being deposited by me with the United States Postal Service as Express Mail with Receipt No. EL010850608US in an envelope addressed to Box PCT, Assistant Commissioner for Patents, Washington, DC 20231, on August 14, 2001.

By: 

FORM PTC-1390 (Modified) (REV 11-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER <b>Muller-26</b>	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR <b>09/831797</b>	
INTERNATIONAL APPLICATION NO. <b>PCT/DE00/03163</b>		INTERNATIONAL FILING DATE <b>13 September 2000</b>		PRIORITY DATE CLAIMED <b>13 September 1999</b>	
TITLE OF INVENTION <b>Tenside Composition Containing Gemini Tensides and Use Thereof for Cleaning Skin and Hair</b>					
APPLICANT(S) FOR DO/EO/US <b>Klaus Kwetkat and Gerd H. Dahms</b>					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
<ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li>3. <input type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.</li> <li>4. <input type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31).</li> <li>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371 (c) (2)) <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input checked="" type="checkbox"/> has been communicated by the International Bureau.</li> <li>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</li> </ol> </li> <li>6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> is attached hereto.</li> <li>b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</li> </ol> </li> <li>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3)) <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input type="checkbox"/> have been communicated by the International Bureau.</li> <li>c. <input checked="" type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</li> <li>d. <input type="checkbox"/> have not been made and will not be made.</li> </ol> </li> <li>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</li> <li>9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).</li> <li>10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).</li> <li>11. <input type="checkbox"/> A copy of the International Preliminary Examination Report (PCT/IPEA/409).</li> <li>12. <input checked="" type="checkbox"/> A copy of the International Search Report (PCT/ISA/210).</li> </ol> <p><b>Items 13 to 20 below concern document(s) or information included:</b></p> <ol style="list-style-type: none"> <li>13. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</li> <li>14. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included</li> <li>15. <input type="checkbox"/> A <b>FIRST</b> preliminary amendment.</li> <li>16. <input type="checkbox"/> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment.</li> <li>17. <input checked="" type="checkbox"/> A substitute specification.</li> <li>18. <input type="checkbox"/> A change of power of attorney and/or address letter.</li> <li>19. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.</li> <li>20. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).</li> <li>21. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</li> <li>22. <input checked="" type="checkbox"/> Certificate of Mailing by Express Mail</li> <li>23. <input checked="" type="checkbox"/> Other items or information: <ol style="list-style-type: none"> <li>1. Certificate of Mailing by Express Mail No. EL010850801US</li> <li>2. Acknowledgment postcard</li> </ol> </li> </ol>					

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/831797

INTERNATIONAL APPLICATION NO.

PCT/DE00/03163

ATTORNEY'S DOCKET NUMBER

Muller-26

24. The following fees are submitted:

CALCULATIONS PTO USE ONLY

**BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5)) :**

- ☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... **\$1000.00**
- ☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... **\$860.00**
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... **\$710.00**
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... **\$690.00**
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ..... **\$100.00**

**ENTER APPROPRIATE BASIC FEE AMOUNT =****\$860.00**

Surcharge of **\$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

**\$0.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	75 - 20 =	55	x \$18.00	<b>\$990.00</b>
Independent claims	1 - 3 =	0	x \$80.00	<b>\$0.00</b>
Multiple Dependent Claims (check if applicable). <input checked="" type="checkbox"/>				<b>\$270.00</b>

**TOTAL OF ABOVE CALCULATIONS =****\$2,120.00**

- ☐ Applicant claims small entity status. (See 37 CFR 1.27). The fees indicated above are reduced by 1/2.

**\$0.00****SUBTOTAL =****\$2,120.00**

Processing fee of **\$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

**\$0.00****TOTAL NATIONAL FEE =****\$2,120.00**

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☐

**\$0.00****TOTAL FEES ENCLOSED =****\$2,120.00**

Amount to be:  
refunded \$  
charged \$

- a. ☒ A check in the amount of **\$2,120.00** to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \_\_\_\_\_ to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **02-4345**. A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

C. James Bushman  
Browning Bushman  
5718 Westheimer, Suite 1800  
Houston, Texas 77057-5771  
Tel.: (713) 266-5593  
Fax: (713) 266-5169

SIGNATURE

C. James Bushman

NAME

24,810

REGISTRATION NUMBER

May 12, 2001

DATE

D 99007 PCT

**SURFACTANT COMPOSITION CONTAINING GEMINI SURFACTANTS AND  
ITS USE FOR SKIN AND HAIR CLEANING PREPARATIONS**

This invention relates to a surfactant composition containing one or more gemini  
surfactant(s) and at least one different detergent component with mild, poor initial  
foaming characteristics, and to the use of such composition as a multifunctional  
cosmetic preparation for cleaning and treating the skin and hair.

In order to largely avoid skin injuries caused by daily cleaning of the skin and hair, it is  
essential to employ non-irritating, mild detergents. It is known, however, that the  
foaming power of a surfactant used as one of the basic constituents of a detergent  
decreases considerably as its mildness increases so that satisfactory initial foaming of  
such surfactants on the skin and hair with large spreading of the foam and the desirable  
absorption of dirt cannot be guaranteed. If such surfactants are nevertheless employed  
in detergents, it is frequently necessary to combine them with far less mild surfactants.

Recently, gemini surfactants have been examined and found to be exceptionally mild to  
the skin. Owing to their poor foaming power, however, they have not been widely used  
in cleaning preparations. For a comprehensive survey of the state of the art regarding  
gemini surfactants, see R. Zana 'Bolaform and dimeric (gemini) surfactants', *Novel  
Surfactants: Preparation, Application and Biodegradability*, C. Holmberg (ed.), Marcel  
Dekker, (1998), 81,103.

EP-A-0 697 244 discloses amphoteric gemini surfactants, which can also be mixed with  
other anionic, nonionic, cationic, or amphoteric surfactants. Said surfactants are  
reported to be useful in detergents.

The gemini surfactants (gemini amides) described in WO 95/19953 can be employed  
among others as components in customary cleaning preparations. In WO 95/19955  
gemini polyethers have been disclosed as another class of gemini surfactants, which are  
useful for the same application mentioned hereinbefore. Mixtures of alkoxyated  
bisalkylphenol gemini surfactants and other surfactants are known from WO 97/23449.

In JP-A 11/60430 and JP-A 11/60437 the use of anionic gemini surfactants in  
cosmetics has been described. Reportedly, these surfactants can also be combined with  
other surfactants.

It is an object of the present invention to provide surfactant blends, which will allow to preserve the dermatological advantages of gemini surfactants while simultaneously enhancing their foaming power and to increase thus the cleaning power of the surfactant compositions to an extent which will make them superior to conventional skin and hair cleaning preparations.

According to the present invention, the problem has been solved by providing a surfactant composition containing besides other constituents the following components:

- (A) 1 to 90 wt%, preferably 10 to 80 wt%, 20 to 60 wt%, or even 30 to 50 wt%, each referring to the total quantity of components (A) and (B), of one or more gemini surfactant(s) and,
- (B) referring to the remainder, 99 to 10 wt%, or 90 to 20 wt%, 80 to 40 wt%, or 70 to 50 wt%, each based on the total quantity of components (A) and (B), of at least one additional different detergent component having mild, poor initial foaming characteristics.

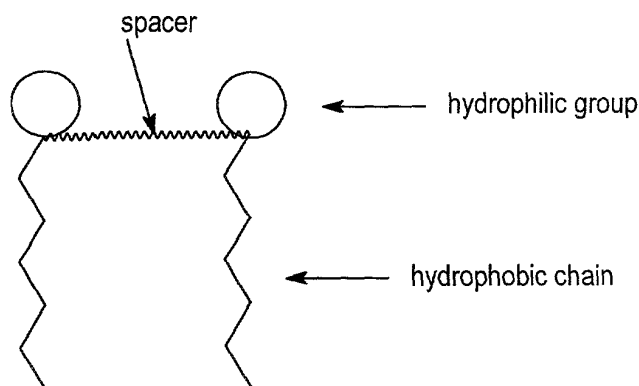
The preferred embodiments of the subject invention are set out in the subordinate claims.

It has unexpectedly been found that the surfactant composition of the invention yields an exceptionally creamy and fine-bead wet foam with very good initial foaming features, which is desirable for skin and hair cleaning preparations. Moreover, such surfactant blends when applied to the hair are superior by the significantly improved combability of wet/dry hair due to the high affinity of the gemini surfactants and the good antistatic features. When utilized in skin cleaners, the preparations have been found to make the skin silky and to allow satisfactory regreasing of the skin. The blends of the present invention are outstanding by their considerably improved non-irritating characteristics in comparison with customary anionic surfactants. For example, by addition of the surfactant compositions of the invention to alkylether sulfates, alkyl benzene sulfonates, and other anionic surfactants, the irritating effect can be distinctly reduced.

For the purpose of the present invention the term 'gemini surfactant' is defined as a surface-active compound consisting of at least (preferably) two surfactant units, i.e. one hydrophilic head group and one hydrophobic group interlinked through at least (preferably) one spacer in proximity to the head group. Gemini surfactants are also

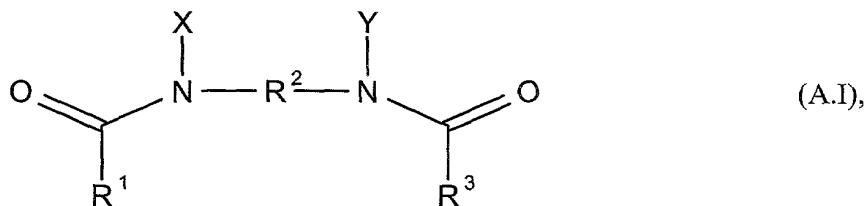
termed dimer surfactants because of their specific structure. There exist anionic, nonionic, cationic, and amphoteric gemini surfactants, depending on the kind of head group. The subject matter of the present invention relates to anionic, cationic, and neutral gemini surfactants. However, in contrast to conventional surfactants, which are grouped in the same way, gemini surfactants can also have combinations of different head groups, mostly combinations of nonionic and ionic groups.

Whenever ionic head groups are combined with nonionic ones, the ionic head group shall be predominant in the resultant gemini surfactant, such that combinations of a nonionic head group and an anionic head group can be classified as anionic gemini surfactant. The same applies to combinations of nonionic head groups with cationic or amphoteric ones. As to the surfactant compositions of the invention, it is morphology (i.e. the relative arrangement of different structural units, namely, hydrophilic groups, spacer, hydrophobic chains) that is essential, the type of head group is not. Hence, the gemini surfactants of the present invention have the following structure:



The preferred gemini surfactants used in the surfactant compositions of the invention have nitrogen atoms at the link between spacer, hydrophilic group, and hydrophobic group. More preferably, the gemini surfactants have spacers with amine or amide groups, but also spacers derived from dicarboxylic acids, betaine-derived hydrophilic double head groups, optionally presenting side groups obtained by alkoxylation, especially ethoxylation, which head groups may bear sulfonic acid-, phosphonic acid-, carboxylic acid-, or alcohol groups, including polyalcohols, each of which having hydrophobic chains with 5 to 25 carbon atoms, which are branched or unbranched and may bear up to two non-adjacent double bonds.

The following variants of gemini surfactant structures are particularly useful for the surfactant compositions of the invention.

**Variant A:** Structures based on amide- or amine-containing spacers**A.I** Gemini surfactants of the general formula (A.I) according to WO 96/14926

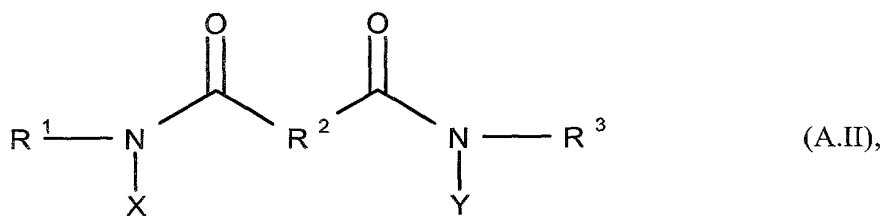
wherein the substituents have the following meanings:

**R<sup>1</sup>, R<sup>3</sup>** C<sub>5</sub>- to C<sub>25</sub>-alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated;

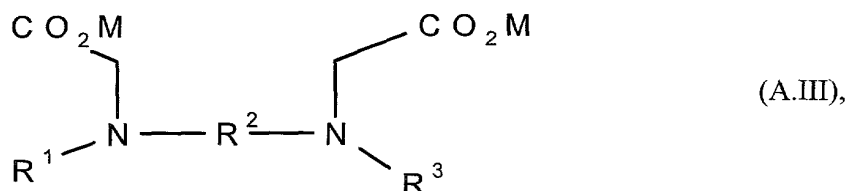
**R<sup>2</sup>** C<sub>1</sub>- to C<sub>12</sub>-alkylene;

**X, Y** (C<sub>2</sub>H<sub>4</sub>O-)<sub>x</sub>(C<sub>3</sub>H<sub>6</sub>O-)<sub>y</sub>-FR; x+y ≥ 1,  
x: 0-15, y: 0-10 ; and

**FR** -SO<sub>3</sub>M, -CH<sub>2</sub>-CO<sub>2</sub>M, -P(O)(OM)<sub>2</sub>, H, -C<sub>3</sub>H<sub>6</sub>SO<sub>3</sub>M; or  
-CH<sub>2</sub>(CHOH)<sub>4</sub>CH<sub>2</sub>OH, insofar as x+y=0, wherein M = alkali,  
(alkyl) ammonium, alkanol ammonium, H, or ½ alkaline earth.

**A.II** Gemini surfactants having dicarboxylic acid-based spacers of the general formula (A.II) in accordance with WO 96/25388

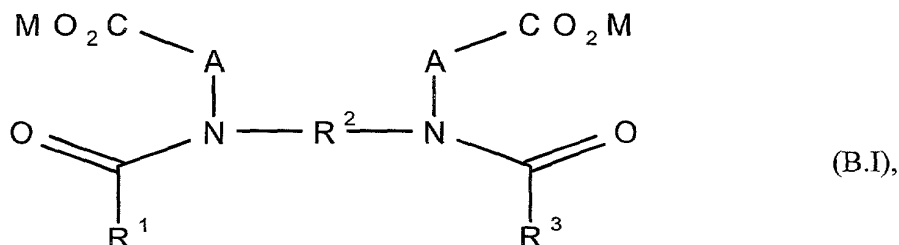
wherein the substituents have the meanings as defined hereinabove by the general formula (A.I).

**A.III** Amphoteric gemini surfactants of the general formula (A.III) in accordance with WO 97/31890

wherein the substituents have the meanings as defined hereinabove by the general formula (A.I). Gemini surfactants of the general formula (A.III) are amphoteric compounds, which can turn into cationic ones if the ambient medium is acidic.

**Variant B:** Structures based on amide- or amine-containing spacers

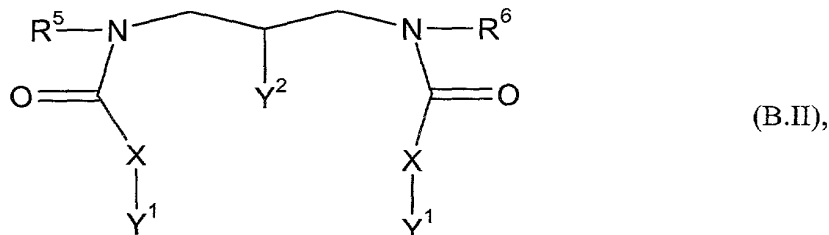
**B.I** Gemini surfactants of the general formula (B.I) in accordance with DE 19622612 or JP-A 10-175934



wherein the substituents have the following meanings:

- R<sup>1</sup>, R<sup>3</sup>** C<sub>5</sub>- to C<sub>25</sub>-alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated;
- R<sup>2</sup>** C<sub>1</sub>- to C<sub>12</sub>-alkylene;
- A** CHR<sup>4</sup>, CH<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>3</sub>H<sub>6</sub>, C<sub>4</sub>H<sub>8</sub>;
- R<sup>4</sup>** aminocarboxylic acid radical; and
- M** alkali, (alkyl) ammonium, alkanol ammonium, H, or ½ alkaline earth.

**B.II** Gemini surfactants of the general formula (B.II) in accordance with EP 0 708 079





wherein the substituents have the meanings as defined hereinabove by the general formula (B.I) and

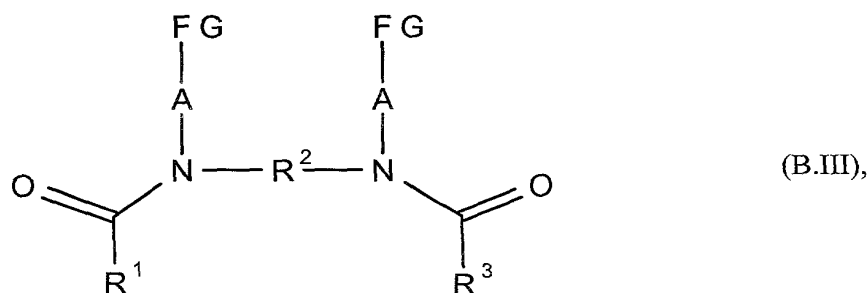
$R^5, R^6$  represent  $C_6$ - to  $C_{36}$ -alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated;

$X$  is an alkylene- or alkenylene group having from 1 to 6 carbon atoms, which may be substituted with a hydroxyl group or a sulfonic acid group or a carboxy group;

$Y^1$  is a sulfonate- or sulfate group or a carboxyl group, and

$Y^2$  represents a hydroxyl group, a sulfuric acid residue, or  $-O-(CO)X-COOH$ .

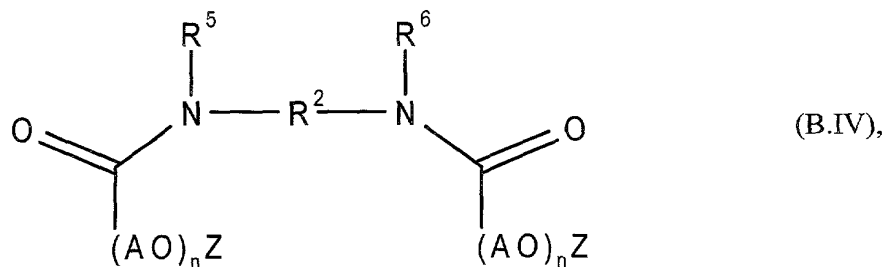
**B.III** Gemini surfactants of the general formula (B.III) according to JP-A-8-311003



wherein the substituents have the meanings as defined hereinabove by the general formula (B.I) and

**FG** represents  $-\text{COOM}$  or  $-\text{SO}_3\text{M}$ .

**B.IV** Gemini surfactants of the general formula (B.IV) according to JP-A 11-60437

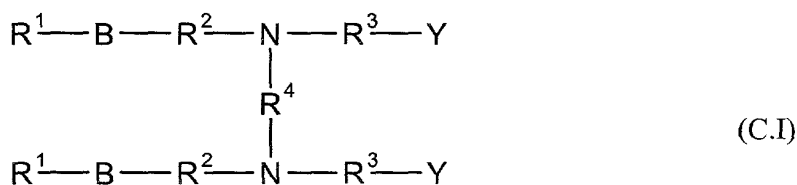


wherein the substituents have the meanings as defined hereinabove by the general formulas (B.I) and (B.II) and

- AO** represents alkylene oxide units, i.e. ethyleneglycol-, propyleneglycol-, and butyleneglycol ether units, alone or arranged randomly or blockwise, wherein n = 1 to 20, and
- Z** is -SO<sub>3</sub>M, -C<sub>2</sub>H<sub>4</sub>SO<sub>3</sub>M, -C<sub>3</sub>H<sub>6</sub>SO<sub>3</sub>M, -P(O)(OM)<sub>2</sub> or -CH<sub>2</sub>-COOM, -C<sub>2</sub>H<sub>4</sub>-COOM.

**Variant C:** Structures based on amide- or amine-containing spacers

**C.I** Gemini surfactants of the general formula (C.I) according to EP 0 697 244,

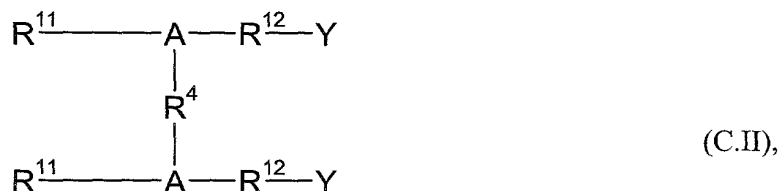


wherein the substituents have the following meanings:

- R<sup>1</sup>** C<sub>5</sub>- to C<sub>25</sub>-alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated, hydroxy-substituted or perfluorinated;
- R<sup>2</sup>** C<sub>1</sub>- to C<sub>12</sub>-alkylene or hydroxy-substituted derivatives thereof;
- B** an amide group [-C(O)N(R<sup>2</sup>)- or -N(R<sup>5</sup>)C(O)-], a carboxyl group [-C(O)O- or -OC(O)-], a polyether group [-O(R<sup>6</sup>-O)<sub>x</sub>-];
- R<sup>5</sup>** C<sub>1</sub>- to C<sub>4</sub>-alkyl or hydroxy-substituted alkyl or H;
- R<sup>6</sup>** C<sub>2</sub>- to C<sub>4</sub>-alkylene;
- x** a number from 1 to 20;
- R<sup>3</sup>** C<sub>1</sub>- to C<sub>12</sub>-alkyl or hydroxy-substituted derivatives thereof, R<sup>7</sup>-D-R<sup>7</sup> or a poly-ether group [-O(R<sup>6</sup>-O)<sub>x</sub>-];
- R<sup>7</sup>** C<sub>1</sub>- to C<sub>6</sub>- alkylene or hydroxy-substituted derivatives thereof;
- D** -O-, -S-, -N(R<sup>8</sup>)- ;
- R<sup>4</sup>** alkylene or alkylaryl having from 1 to 12 carbon atoms or the hydroxy-substituted derivatives or R<sup>9</sup>-D<sup>1</sup>-R<sup>9</sup> ;
- R<sup>8</sup>** C<sub>1</sub>- to C<sub>12</sub>-alkyl or hydroxy-substituted alkyl or H or R<sup>9</sup>-D<sup>1</sup>-R<sup>9</sup>;
- R<sup>9</sup>** C<sub>1</sub>- to C<sub>6</sub>-alkylene or hydroxy-substituted derivatives thereof or aryl;
- D<sup>1</sup>** -O-, -S-, -SO<sub>2</sub>-, -C(O)-, [-O(R<sup>7</sup>-O)<sub>x</sub>-], (R<sup>10</sup>)<sub>t</sub>[N(R<sup>10</sup>)]<sub>z</sub> or aryl;

- $R^{10}$   $C_1$ - to  $C_{12}$ -alkyl or hydroxy-substituted alkyl or H or aryl;  
 $t, z$  are independently a number from 1 to 4, and  
 $Y$  is independently  $-SO_3H$ ,  $O-SO_3H$ ,  
 $-OP(O)(OH)_2$ ,  $-P(O)(OH)_2$ ,  $-COOH$ ,  
 $-CO_2-C_6H_4-SO_3H$  and the salts thereof.

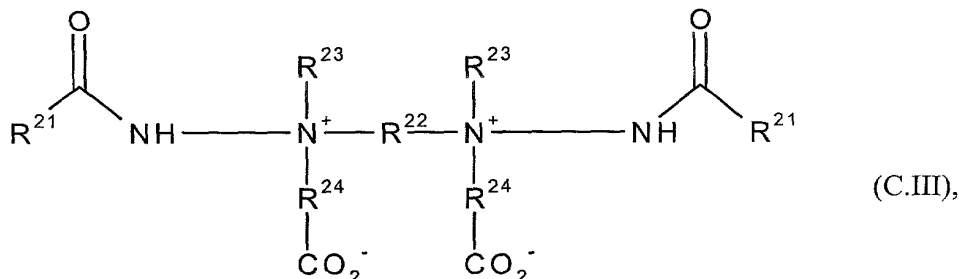
**C.II** Gemini surfactants of the general formula (C.II) according to EP 0 697 245



wherein the substituents have the meanings as defined hereinabove by the general formula (C.I) and

- $R^{11}$  is  $C_5$ - to  $C_{23}$ -alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated, hydroxy-substituted or perfluorinated or  $R^{14}-B-R^2$ ;  
 $R^{14}$  is  $C_1$ - to  $C_{12}$ -alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated, or the hydroxy-substituted derivatives;  
 $R^{12}$  means  $C_1$ - to  $C_{12}$ -alkylene, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated, or the hydroxy-substituted derivatives, or an amide group  $[-C(O)N(R^2)-$  or  $-N(R^5)C(O)-]$ , a carboxyl group  $[-C(O)O-$  or  $-OC(O)-]$ , a polyether group  $[-O(R^6-O)_x-]$  or  $R^9-D^1-R^9$  and  
 $A$  is  $-CR^6=$  or  $-N=$ , if whenever  $A$  is equal to  $-N=$ ,  $R^{11}$  represents  $R^{14}-B-R^2$ .

**C.III** Gemini surfactants of the general formula (C.III) according to DE 4227391 and DE 19608117



wherein the substituents have the meanings as defined hereinabove by the general formulas (C.I) and (C.II) and

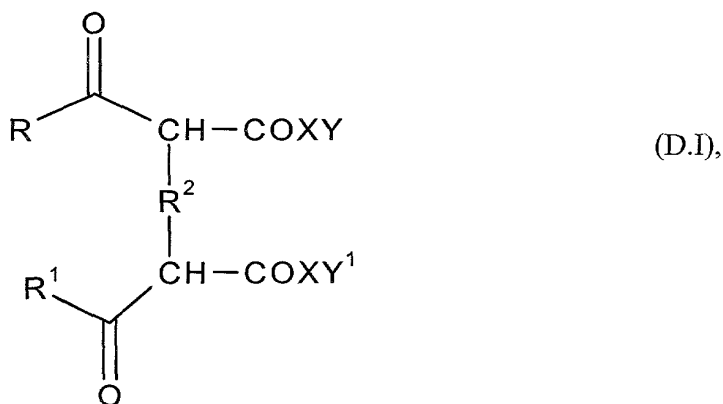
$R^{21}$  represents  $C_5$ - to  $C_{23}$ -alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated;

$R^{22}$ ,  $R^{24}$  are  $C_1$ - to  $C_6$ -alkylene;

$R^{23}$  is methyl, ethyl, propyl, or a polyether group  $[-O(R^6-O)_x-]$ .

#### Variant D:

**D. I** Gemini surfactants of the general formula (D.I) according to US 5,863,886



wherein the substituents have the following meanings:

$R$ ,  $R^1$   $C_5$ - to  $C_{30}$ -alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated, hydroxy-substituted or perfluorinated;

$R^2$   $C_1$ - to  $C_{10}$ -alkylene, arylene, and hydroxy-substituted derivatives, a polyether  $[-O(R^4O)_x-]$ , -S-, -SO<sub>2</sub>-, -O-, -S-S-, -O-R<sup>5</sup>-O-, or -S-R<sup>5</sup>-S-; variable for a direct bond between the two  $\alpha$ -carbons;

$R^4$   $C_2$ - to  $C_4$ -alkylene;

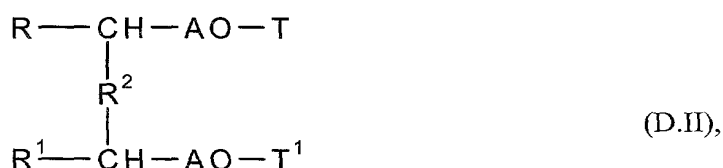
$R^5$   $C_1$ - to  $C_{10}$ -alkylene, arylene or alkyl arylene, -N(R<sup>6</sup>)-, or - (NR<sup>6</sup>)-R<sup>7</sup>-(NR<sup>6</sup>)- ;

$R^6$   $C_1$ - to  $C_6$ -alkyl;

$R^7$   $C_1$ - to  $C_6$ -alkyl, wherein  $R^7$  and  $R^6$  can also be part of a heterocyclic ring;

- X** polyether  $[-O(R^4O)_x-]$ , wherein x is a number from 1 to 30, -O-, NZ;
- Z**  $C_1$ - to  $C_{10}$ -alkyl, aryl, alkylaryl, or H, and
- Y, Y<sup>1</sup>** are independently H,  $-CH_2-COOH$  and salts, a hydrocarbon radical having at least two hydroxyl groups, such as erythrose, threose, ribose, arabinose, xylose, fructose, lyxose, allose, altrose, glucose, mannose, galactose and mixtures thereof.

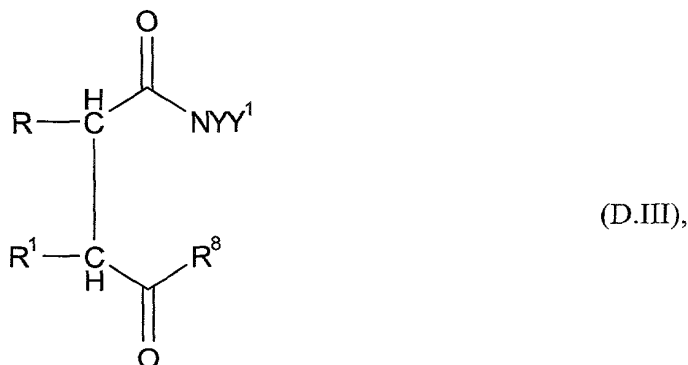
**D.II** Gemini surfactants of the general formula (D.II)



wherein the substituents have the meanings as defined hereinabove by the general formula (D.I) and

- AO** means  $-C(O)-$ ,  $-C(O)-[-O(R^4O)_x-]$ ,  $-CH_2-[-O(R^4O)_x-]$ ,  $-CH_2-O-$ ;
- T, T<sup>1</sup>** are independently  $-OM$ ,  $-H$ ,  $-CH_3$ ,  $-C_2H_5$ ,  $-SO_3M$ ,  $-CH_2COOM$ ,  $-C_2H_4COOM$ ,  $-C_3H_6SO_3M$ ,  $-O-P(O)(OM)_2$  and
- M** is alkali,  $\frac{1}{2}$  alkaline earth, ammonium, mono-, di-, trialkanolammonium, or H.

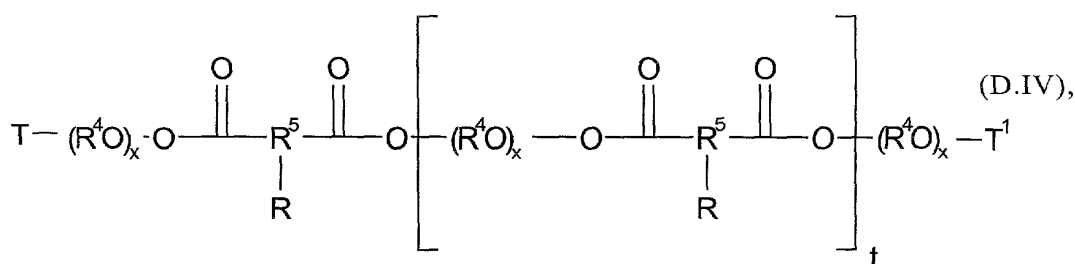
**D.III** Gemini surfactants of the general formula (D.III) according to WO 96/16930



wherein the substituents have the meanings as defined hereinabove by the general formulas (D.I) and (D.II) and

$R^8$  is  $NY Y^1$ ,  $-O(R^4O)_xH$  or  
 $-O(R^4O)_x-C(O)-CHR-CHR^1-C(O)NY Y^1$ .

**D.IV** Gemini surfactants of the general formula (D.IV) according to WO  
 96/25384



wherein the substituents have the meanings as defined hereinabove by the  
 general formulas (D.I), (D.II), and (D.III) and

$t$  is an integer from 1 to 100, preferably 1 to 20, most preferably  
 1 to 4.

Among the detergents with mild, poor-foaming characteristics, the compounds defined  
 hereinbelow are preferably employed in the surfactant compositions:

Water-soluble sugar surfactants, acylated protein derivatives, sulfosuccinates,  
 particularly sodium-, -mono-, and -dialkanolsulfosuccinates with branched or  
 unbranched, saturated or non-adjacently mono- to triunsaturated alkyl residues in the  
 range of from  $C_6$  to  $C_{18}$ , or acyllactylates, particularly sodium-, potassium-,  
 magnesium-, or calcium salts of at the hydroxyl group of linear or branched, saturated  
 or non-adjacently mono- to triunsaturated, cyclic or acyclic carboxylic acids with  $C_6$ - to  
 $C_{24}$ -esterified, monomeric lactic acid or the oligomers thereof, wherein the  
 oligomerization degree of the lactic acid is preferably from 1.1 to 10, most preferably  
 from 1.1 to 4, or alkyl-(poly)glucosides with an oligomerization degree of from 1.0 to  
 10, preferably from 1 to 3, and alkyl residues, which are branched or unbranched,  
 saturated or non-adjacently mono- to triunsaturated, cyclic or acyclic and have from 6 to  
 24 carbon atoms, or alkali-, alkaline earth-, mono-, di-, and trialkanol ammonium-,  
 ammonium-, mono-, di-, trialkylammonium salts of alkylisethionates, which contain  
 alkyl residues with 6 to 24 carbon atoms and are branched or unbranched, saturated or  
 non-adjacently mono- to triunsaturated, or alkali-, alkaline earth-, mono-, di-, and  
 trialkanol-ammonium-, ammonium-, mono-, di-, tri-alkylammonium salts of  
 acylsarcosinates, which contain alkyl residues with 6 to 24 carbon atoms and are

5 branched or unbranched, saturated or non-adjacently mono- to tri-unsaturated, or protein condensates with C<sub>6</sub>- to C<sub>24</sub>-acyl residues, which are branched or unbranched, saturated or non-adjacently mono- to triunsaturated, or betaines having alkyl chains with 6 to 24 carbon atoms, which may be branched or linear, saturated or non-adjacently mono- to triunsaturated. Among betaines, those of the amido-amine type are preferred. Acylglutamates with 6 to 24 carbon atoms in the acyl chain, which can be linear or branched, saturated or non-adjacently mono- to triunsaturated, are also useful. In addition, particularly preferable detergent components for use in the blends of the present invention include acyllactylates and acylglutamates, and among the group of  
10 acyllactylate salts, the sodium salt of lauroyllactylate or of steraoyllactylate are especially suitable.

15 By the term 'mild' employed herein is meant that the compounds/compositions are not subject to labelling as irritating to the skin and eyes, e.g. according to directive 67-548-EEC, Hazardous Materials Ordinance.

20 By the term 'with poor-foaming characteristics' used herein is meant that the surfactants, when utilized as additional detergent components, do not fulfill two of the three requirements defined hereinbelow.

#### Foaming Behavior Criteria:

- Lamella thickness, in mm, immediately after foam formation,
- number of blisters per image surface (100fold magnification) immediately after foam formation, both determined by the foam microscopy, and
- 25 - initial foaming by hand test.

30 The oil component preferably comprises vegetable oils and ester oils, such as triglycerides of C<sub>4</sub>- to C<sub>26</sub>- fatty acids, branched, unbranched, mono- to triunsaturated, or paraffin oils, i.e. hydrocarbons with chain lengths of up to C<sub>16</sub> (liquid; beyond this solid) or silicone oils. Typical examples of vegetable oils include sunflower-, rape-, soybean-, lavender-, aniseed-, rosemary-, spruce-, and larch oil, tea-tree (*melaleuca alternifolia*) oil, calendula oil, evening-primrose (*oenothera biennis*) oil, or cosmetic oils, such as avocado-, jojoba oil, or aloe vera.

## **Experiment**

8 wt% of the surfactant under examination were dissolved in demineralized water. The resultant surfactant solution was stirred for 10 minutes using a vane stirrer at 1,500 rpm, whereby the solution was slightly heated from room temperature to approx. 35°C. After 10 minutes of stirring, the foam thus prepared was skimmed from the surface and was immediately examined microscopically (measurement of lamella thickness, in mm; determination of the number of foam blisters in the respective image frame).

Besides the quality of the foam produced by stirring, the initial foaming characteristics of a surfactant are also evaluated using cold, running tap water. For this purpose, 2 grams of surfactant are spread on the palm and are evenly rubbed in with running water. The foam quality is evaluated by four grades, namely 0 = no foaming, 1 = moderate foaming, 2 = good foaming, and 3 = excellent foaming.

Surfactants are rated poor-foaming, if they cannot fulfill at least two of the following three criteria, namely if the lamella thickness is less than or equal to 16 mm, or if the number of blisters in the image frame is less than or equal to 16, or if the initial foaming rating is 1 or less.

Surfactants are rated good-foaming, if they fulfill the three criteria insofar as the lamella thickness is

≥ 20 mm, the number of blisters in the image frame is

≥ 20, and the initial foaming rating is 3.

The blends of the invention are useful in the following formulations: skin and hair cleaning preparations, shampoos, baby shampoos, antidandruffs shampoos, aerosol shampoos, aerosol shower gels, washing-, shower-, and bathing gels, foam baths, oil foam baths, face wash creams, liquid handwash soaps, synthetic soaps (syndets), and combibar-type bar soaps. They can be employed alone or in combination with other detergents, and they are used in the formulations described herein in quantities of from 0.1 to 90 wt%, preferably 1 to 30 wt%, most preferably 1 to 15 wt%, based on the blend of the present invention.

Examples of other constituents, which can be combined with the blends of this invention in skin and hair cleaning formulations, include: alkylsarcosinates, fatty



alcohol ether sulfates, fatty alcohol sulfates, imidazolinium derivates, taurates, sulfobetaines, olefin sulfonates, ethercarboxylic acids and their salts, alkylaminioxides, ethoxylated fatty alcohols, ethoxylated fatty acids and their diesters, esters of ethoxylated polyols, fatty acid di- and -monoethanolamides, fatty acid mono-, -di-, and -triglycerides and their derivatives (-sulfates, -lactylates, -lactates, -citrate, -tartrates), ethoxylated castor oils and dehydrated castor oil derivatives, phospholipids, cationic surfactants and polymers, antidandruff preparations, starch derivatives, glycerol esters and their ethoxylates, polyglycerol esters, sorbitan esters and their ethoxylates, silicone oils, silicone copolymers, panthenol, panthenolether, vitamin E and its derivatives, vitamin A and its derivatives, citric acid, lactic acid, hyaluronic acid, polyvinylpyrrolidone, polyacrylates, xanthane rubber, protein hydrolysates, acylglutamates. UVB filters (oil-soluble or water-soluble); examples of oil-soluble substances include: 3-benzylidene camphor and its derivatives, e.g. 344-(methylbenzylidene) camphor, 4-aminobenzoic acid derivatives, preferably 4-dimethyl-aminobenzoic acid (2-ethylhexyl)ester, (4-di-methylamino)-benzoic acid - amyl ester, esters of cinnamic acid, preferably 4-methoxycinnamic acid(2-ethylhexyl) ester, 4-methoxycinnamic acid isopentyl ester; esters of salicylic acid, preferably salicylic acid-(2-ethylhexyl) ester, salicylic acid-(4-isopropylbenzyl)ester, salicylic acid homomenthyl ester; derivatives of benzophenone, preferably 2-hydroxy-4-methoxybenzophenone, 2-hydroxy-4-methoxy-methylbenzophenone, 2,2'-dihydroxy-4-methoxy-benzophenone, esters of benzylmalonic acid. Examples of useful water-soluble substances include 2-phenylbenzimidazole-5-sulfonic acid and its salts, e.g. sodium-, potassium-, or triethanol ammonium salts, sulfonic acid derivatives of benzophenones and their salts; sulfonic acid derivatives of 3-benzylidene camphor and their salts.

The present invention will be further described with reference to the following examples.

### Examples

Gemini surfactants employed herein:

Gemini Surfactant (General Formula)	Structure
A.A (A.I)	$R^1 = R^3 = C_{11}H_{23}/C_{13}H_{27}$ , $R^2 = C_2H_4$ , $X = Y = (C_2H_4O-)_x(C_3H_6O-)_ySO_3Na$ , wherein $x = 14$ , $y = 0$
B.A (B.I)	$R^1 = R^3 = C_{11}H_{23}/C_{13}H_{27}$ , $R^2 = C_2H_4$ , $A = CH_2$ , $M = Na$
B.B (B.II)	$R^5 = R^6 = C_{12}H_{25}/C_{14}H_{29}$ , $X = C_2H_4$ , $Y^1 = CO_2Na$ , $Y^2 = -O-C(O)-C_2H_4-CO_2Na$
B.C (B.II)	$R^5 = R^6 = C_{12}H_{25}/C_{14}H_{29}$ , $X = C_2H_4$ , $Y^1 = CO_2Na$ , $Y^2 = -O-C(O)-C_2H_4-CO_2Na$
C.A (C.I)	$R^1 = C_{11}H_{23}$ , $B = C_2H_4$ , $R^3 = CH_2$ , $R^4 = C_2H_4$ , $Y = COONa$
D.A (D.I)	$R, R^1 = -C_{11}H_{23}$ , $R^2 = -S-$ , $X = NZ$ , $Z = -CH_3$ , $Y$ , $Y^1 = \text{glucosyl residue}$
D.B (D.II)	$R, R^1 = -C_{11}H_{23}$ , $R^2 = \text{single bond}$ $AO = -C(O)-$ , $T, T^1 = OM$ , $M = Na$
D.C (D.III)	$R, R^1 = C_{12}H_{24}$ , $R^8 = NYY^1$ , $Y = -CH_3$ , $Y^1 = \text{glucosyl residue}$

### Methods of Test

In order to characterize the foams, 8 wt% of the surfac-tants or surfactant blends were dissolved in demineralized water. The resultant surfactant solutions were stirred for 10 minutes using a vane stirrer at 1,500 rpm, whereby the solutions were slightly heated from room temperature to approx. 35°C.

The procedure for making foam is illustrated by figures 1 to 3:

Fig. 1 Vane stirrer for making foam

Fig. 2 Test apparatus for making foam  
(dimensions in cm, wherein H means height of the nonfoamed solution)

Fig. 3 Condition after foaming  
(peripheral velocity of the vane stirrer = 5 m/s; S = foam; D = detergent solution).

After 10 minutes of stirring, the foam thus prepared was skimmed from the top and examined microscopically (immediately, after 2, 5, and 15 minutes). The test procedure was ever the same, thus allowing to evaluate the influence of the surfactant blends on the foaming behavior.

	(1)	(2)	(3)	(4)	(5)	(6)
	[%w/ w]	[%w/ w]	[%w/ w]	[%w/ w]	[%w/ w]	[%w/ w]
<b>Phase A</b>						
Surfactant	8.0	6.4	4.8	3.2	1.6	
<b>Gemini surfactant</b>		1.6	3.2	4.8	6.4	8.0
<b>A.A</b>						
<b>Phase B</b>						
Demin. water	92.0	92.0	92.0	92.0	92.0	92.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

#### Preparation

- Weigh in phase A and melt at 80°C.
- Allow to cool, then add phase B.
- Stir for 10 minutes using a vane stirrer.
- Take product samples after 0, 2, 5, and 15 minutes.

The foam quality was evaluated by measuring the lamella thickness and determining the number of blisters found in the image frame (100fold magnification). It is known that the amount of cleaning fluid provided by the foam for wetting the skin and absorbing dirt increases as the lamella thickness increases, in other words, the thicker the foam lamella produced, the better the cleaning effect. The number of blisters per area is a measure of the fine porosity of the foam and can be referred to for characterizing the product touch on the skin.

The results of the foam evaluations with reference to the lamella thickness of the foam, expressed in mm (with 100fold magnification), have been compiled hereinbelow for blends of a gemini surfactant of the sodium diamide ethersulfate type and different mild surfactants with unsatisfactory foaming characteristics for skin and hair cleaning applications.

**Example 1**

Foam lamella thickness as a function of the mixing ratio of sodium lauroyl lactylate and gemini surfactant

	(1)	(2)	(3)	(4)	(5)	(6)
Time [ min ]	8.0 / 0.0	6.4 / 1.6	4.8 / 3.2	3.2 / 4.8	1.6 / 6.4	0.0 / 8.0
0	4	12	22	28	18	3
2	2	10	22	25	15	2
5	1	8	18	22	14	<1
15	<1	6	12	20	13	<1

**Example 2**

Number of foam blisters as a function of the mixing ratio of sodium lauryl lactylate and gemini surfactant

	(1)	(2)	(3)	(4)	(5)	(6)
Time [ min ]	8.0 / 0.0	6.4 / 1.6	4.8 / 3.2	3.2 / 4.8	1.6 / 6.4	0.0 / 8.0
0	4	12	22	28	18	3
2	2	10	22	25	15	2
5	1	8	18	22	14	<1
15	<1	6	12	20	13	<1

**Example 3**

Foam lamella thickness as a function of the mixing ratio of sodium cocoylisethionate (*Arlatone SCI*, ICI Surfactants, Everberg, Belgium) and gemini surfactant

	(1)	(2)	(3)	(4)	(5)	(6)
Time [ min ]	8.0 / 0.0	6.4 / 1.6	4.8 / 3.2	3.2 / 4.8	1.6 / 6.4	0.0 / 8.0
0	4	12	22	28	18	3
2	2	10	22	25	15	2
5	1	8	18	22	14	<1
15	<1	6	12	20	13	<1

**Example 4**

Number of foam blisters as a function of the mixing ratio of sodium cocoylisethionate (*Arlatone ACI*, ICI Surfactants, Everberg, Belgium) and gemini surfactant

	(1)	(2)	(3)	(4)	(5)	(6)
Time [ min ]	8.0 / 0.0	6.4 / 1.6	4.8 / 3.2	3.2 / 4.8	1.6 / 6.4	0.0 / 8.0
0	12	10	24	25	21	5
2	6	7	17	12	15	2
5	5	6	15	8	8	2
15	4	4	9	6	5	2

**Example 5**

Foam lamella thickness as a function of the mixing ratio of fatty alcohol polyglucosides (*Plantacare 1200*, Henkel, Düsseldorf) and gemini surfactant

	(1)	(2)	(3)	(4)	(5)	(6)
Time [ min ]	8.0 / 0.0	6.4 / 1.6	4.8 / 3.2	3.2 / 4.8	1.6 / 6.4	0.0 / 8.0
0	11	12	14	28	16	3
2	10	10	10	18	16	2
5	9	9	6	14	13	<1
15	5	5	5	10	10	<1

**Example 6**

Number of foam blisters as a function of the mixing ratio of fatty alcohol polyglucosides (*Plantacare 1200*, Henkel, Düsseldorf) and gemini surfactant

	(1)	(2)	(3)	(4)	(5)	(6)
Time [ min ]	8.0 / 0.0	6.4 / 1.6	4.8 / 3.2	3.2 / 4.8	1.6 / 6.4	0.0 / 8.0
0	32	31	17	28	19	5
2	28	24	11	18	12	2
5	20	18	10	14	12	2
15	13	13	9	10	9	2

Besides the foam quality produced by stirring, the initial foaming behavior of the surfactant blends in contact with cold, running tap water was evaluated as well. For this purpose, 2 grams of surfactant blend were spread on the palm and were evenly rubbed in with running water.

Initial foaming of sodium diamide ethersulfates combined with different very mild, poor-foaming surfactants when rubbed in by hand in contact with cold, running water

5

Surfactant	8.0 / 0.0	6.4 / 1.6	4.8 / 3.2	3.2 / 4.8	1.6 / 6.4	0.0 / 8.0
Sodium lauryllactylates and gemini B.A	0	0	+++	+++	+	0
Sodium cocoylisethio- nates and gemini B.B	+	+	+++	+++	++	0
Fatty alcohol polyglycosides und gemini B.C	0	0	+	++	+	0

Surfactant	8.0 / 0.0	6.4 / 1.6	4.8 / 3.2	3.2 / 4.8	1.6 / 6.4	0.0 / 8.0
Sodium lauryllactylates and gemini D.A	0	0	+++	+++	+	0
Sodium cocoylisethio- nates and gemini D.B	+	+	+++	+++	++	0
Fatty alcohol polyglycosides und gemini D.C	0	0	+	++	+	0

Foam rating legend:      0    = no foaming                      +    = moderate foaming  
                                 ++ = good foaming                      +++ = very good foaming

[illegible]

**Example 8: Examples of Formulations, Mild Shampoo**

Brand	CTFA / INCI	Model Form. *	Comparison *	Form. A *	Form. B *
Texapon NSO	Sodium laureth sulfate	40.00	40.00	40.00	40.00
Surfactant composition	Gemini A.I, sodium lauroyl lactylate (50 : 50)	8.0	0	4.00	8.00
Tego Betain F 50	Cocoamidopropyl betaine	0.0	8.00	0.00	0.00
D-Panthenol 75L	Panthenol	1.5	0.00	0.00	0.00
Octopyrox		3.0	0.00	0.00	0.00
Ucare Polymer JR-400	Polyquaternium-10	0.15	0.00	0.00	0.00
Antil 141 liq.	Propyleneglycol, PEG-55 propylene-glycol oleate	2.00	2.00	2.25	2.00
NaCl	Sodium chloride	1.0	1.00	1.25	1.00
Citric acid	Citric acid	0.75	0.00	0.00	0.00
Demin. water	Aqua	ad 100	ad 100	ad 100	ad 100

\* as weight percent

**Preparation:** Mix at 40 °C, then thicken with Antil 141 liq. and NaCl.

In order to examine skin tolerance of the surfactant composition of the invention, the surfactant system of a typical shampoo formulation (alcohol ethersulfate + lenitive additive + thickening system) plus the surfactant composition of the invention were tested.

The aforesaid system was used in a repetitious patch test (Shelanski test) on 20 test persons:

A plastic chamber filled with the product under examination (2% in water) was attached for 24 hours with occlusion to a spot of the skin. This procedure was repeated nine times in three weeks while employing the same spot of the skin. After a two-week pause, the product in the plastic chamber was again attached for 24 hours to the very same spot of the skin as previously and to a non-exposed spot in order to examine the skin for potentially induced reaction. The examinations were made immediately after removal of the test chambers and after 24 h, 48 h, and 72 h.

The test results showed that the formulations A and B exhibit excellent skin tolerance. There were no signs of skin sensitisation. As to their skin-irritating potential, the products are not expected to cause harm.

When using the alcohol ethersulfate/betaine combination (comparative formulation), which is customary today, three test persons were found to have moderate skin irritation (redness, scaling).

#### Example 9

#### Examples of Formulations, Mild Shower Gel

Brand	CTFA / INCI Nomenclature	wt%
Tego Betain F 50	Cocoamidopropyl betaine	25.00
Surfactant composition	Gemini A.I, sodium lauroyl lactylate (50 : 50)	8.00
Arlatone SCI	Sodium cocoyl isothionate	2.00
Antil 141 liq.	Propyleneglycol, PEG-55 propyleneglycol oleate	q.s.
NaCl	Sodium chloride	q.s.
Demin. water	Water	ad. 100

Preparation: Mix at 50 to 60°C, adjust the pH value with citric acid if necessary, then thicken.



**Example 10                      Examples of Formulations, Antimicrobial Cleaning Lotion**

<b>Brand</b>	<b>CTFA /INCI Nomenclature</b>	<b>wt%</b>
N-Cetyl-N,N,N-trimethylammoniumbromide	Cetrimonium bromide	2.00
Tego Betain F 50	Cocoamidopropyl betaine	20.00
DC 193 Surfactant	Dimethicone copolyol	1.50
Ucare Polymer JR 400	Polyquaternium-10	0.10
Surfactant composition	Gemini A.I, sodium lauroyl lactylate (50 : 50)	5.00
Euperlan PK 3000 AM	Glycol distearate, laureth-4, cocoamidopropyl betaine	3.00
Antil 141 liq.	Propyleneglycol, PEG-55 propyleneglycol oleate	q.s.
NaCl	Sodium chloride	q.s.
Demin. water	Water	ad. 100
pH after preparation		5.1

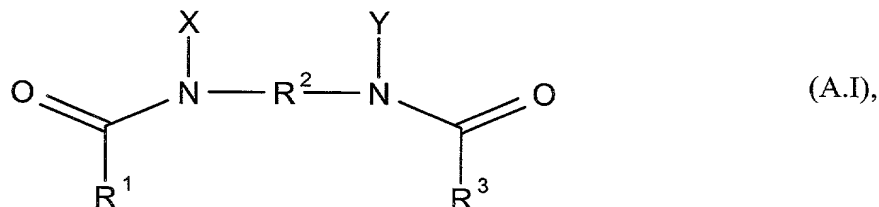
Preparation:                      Mix at 50 to 60°C, then thicken.

**Claims:**

1. A surfactant composition comprising
  - (A) 1 to 90 wt%, referring to the total amount of components (A) and (B), of one or more gemini surfactant(s) and,
  - (B) referring to the remainder, based on the total of components (A) and (B), at least one additional detergent component with poor initial foaming characteristics.
2. The surfactant composition of Claim 1, **characterized in that** the surfactant composition comprises
  - (A) 20 to 60 wt%, referring to the components (A) and (B), of one or more gemini surfactant(s) and,
  - (B) referring to the remainder, based on the total of components (A) and (B), one or more detergent component(s).
3. A surfactant composition according to any one of the preceding claims further comprising
  - (C) at least 0.1 wt% water, referring to the total composition.
4. A surfactant composition according to any one of the preceding claims further comprising
  - (D) at least 0.1 wt% of one or more oil component(s), referring to the total composition.
5. A surfactant composition according to any one of the preceding claims, which comprises as a detergent component sulfosuccinates, acyllactylates, alkyl polyglucosides, alkyl isethionates, acylated protein condensates, betaines, and/or acylglutamates.
6. A surfactant composition according to any one of the preceding claims, **characterized in that** the surfactant composition comprises as a detergent acyllactylates, alkylisethionates, and/or acylglutamates.
7. A surfactant composition according to any one of the preceding claims, **characterized in that** the surfactant composition comprises as a detergent component acyllactylates and/or acylglutamates.

8. A surfactant composition according to any one of the preceding claims, **characterized in that** the surfactant composition comprises as a detergent component sodium-, potassium-, magnesium-, or calcium salts of at the hydroxyl group of linear or branched, saturated or non-adjacently mono- to triunsaturated, cyclic or acyclic carboxylic acids with C<sub>6</sub> to C<sub>24</sub> esterified monomeric lactic acid, or the oligomers thereof, the oligomerization degree of the lactic acid being in the range of from 1.1 to 10, preferably 1.1 to 4.
9. A surfactant composition according to any one of the preceding claims, **characterized in that** the gemini surfactant comprises nitrogen atoms at the link between spacer, hydrophilic group, and hydrophobic group.
10. A surfactant composition according to any one of the preceding claims, **characterized in that** the gemini surfactant or the blend thereof comprises an amine- or amide-group-containing spacer with 1 to 12 carbon atoms.
11. A surfactant composition according to any one of the preceding claims, **characterized in that** the gemini surfactant comprises a hydrophobic double group with a C<sub>6</sub>- to C<sub>24</sub>-hydrocarbon residue each and/or a hydrophilic double (head) group comprising at least one alkoxyated residue bearing a sulfonic acid-, carboxylic acid-, phosphonic acid -, polyalcohol-, or polyalkylene oxide group, which can also be present in salt form.
12. A surfactant composition according to any one of the preceding claims or to any one of claims 28 to 32, **characterized in that** the surfactant composition comprises 1 to 30 wt% of component (A), referring to the total amount of ionic, preferably anionic surfactants, which are no gemini surfactants in conformity with component (A).
13. A surfactant composition according to any one of the preceding claims or to any one of claims 28 to 32, characterized in that the components (A) and (B) are present in the whole composition in a total amount of from 0.1 to 40 wt%, preferably 0.1 to 10 wt%.

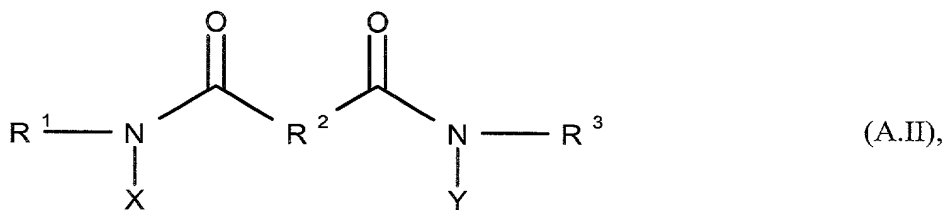
14. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (A.I)



wherein the substituents have the following meanings:

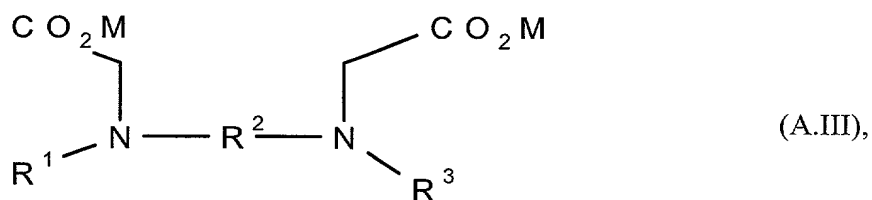
- R<sup>1</sup>, R<sup>3</sup>** C<sub>5</sub>- to C<sub>25</sub>-alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated;  
**R<sup>2</sup>** C<sub>1</sub>- to C<sub>12</sub>-alkylene;  
**X, Y** (C<sub>2</sub>H<sub>4</sub>O-)<sub>x</sub>(C<sub>3</sub>H<sub>6</sub>O-)<sub>y</sub>-FR; x+y ≥ 1, x: 0-15, y: 0-10 ; and  
**FR** -SO<sub>3</sub>M, -CH<sub>2</sub>-CO<sub>2</sub>M, -P(O)(OM)<sub>2</sub>, H, -C<sub>3</sub>H<sub>6</sub>SO<sub>3</sub>M, -CH<sub>2</sub>(CHOH)<sub>4</sub>CH<sub>2</sub>OH, insofar as x+y=0, wherein M = alkali, (alkyl)ammonium, alkanol ammonium, H, or ½ alkaline earth.

15. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (A.II)



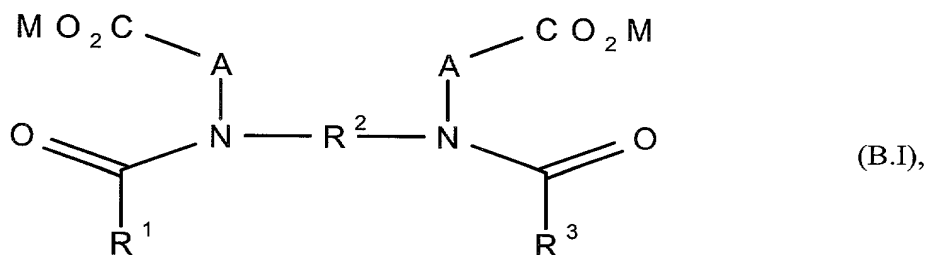
wherein the substituents have the meanings as defined by the general formula (A.I) of claim 14.

16. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (A.III)



wherein the substituents have the meanings as defined by the general formula (A.I) of claim 14.

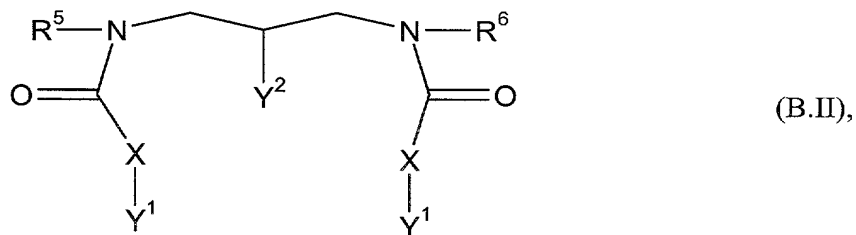
17. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (B.I)



wherein the substituents have the following meanings:

- R<sup>1</sup>, R<sup>3</sup>** C<sub>5</sub>- to C<sub>25</sub>-alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated;  
**R<sup>2</sup>** C<sub>1</sub>- to C<sub>12</sub>-alkylene  
**A** CHR<sup>4</sup>, CH<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>3</sub>H<sub>6</sub>, C<sub>4</sub>H<sub>8</sub>;  
**R<sup>4</sup>** aminocarboxylic acid radical, and  
**M** alkali, (alkyl)ammonium, alkanol ammonium, H, or ½ alkaline earth.

18. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (B.II)



wherein the substituents have the meanings as defined by the general formula (B.I) of claim 17 and

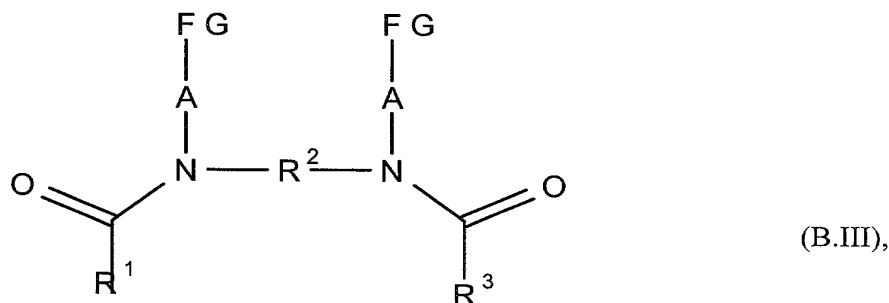
- R<sup>5</sup>, R<sup>6</sup>** represent C<sub>6</sub>- to C<sub>36</sub>-alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated;

**X** is an alkylene- or alkenylene group having from 1 to 6 carbon atoms, which may be substituted with a hydroxyl group or a sulfonic acid group or a carboxy group;

**Y<sup>1</sup>** is a sulfonate- or sulfate group or a carboxyl group, and

**Y<sup>2</sup>** represents a hydroxyl group, a sulfuric acid residue, or  $-O-(CO)X-COOH$ .

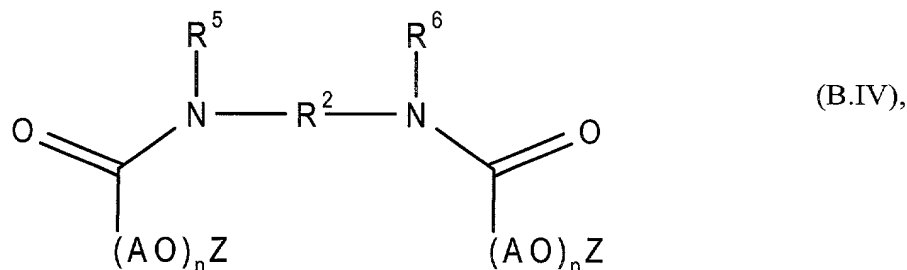
19. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (B.III)



wherein the substituents have the meanings as defined by the general formula (B.I) of claim 17 and

**FG** represents  $-\text{COOM}$  or  $-\text{SO}_3\text{M}$ .

20. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (B.IV)

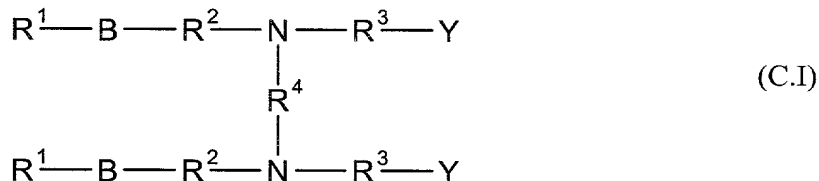


wherein the substituents have the meanings as defined by the general formulas (B.I) of claim 17 and (B.II) of claim 18 and

**AO** represents alkylene oxide units, i.e. ethyleneglycol-, propyleneglycol-, and butyleneglycol ether units, alone or arranged randomly or blockwise, wherein  $n = 1$  to 20, and

**Z** is  $-\text{SO}_3\text{M}$ ,  $-\text{C}_2\text{H}_4\text{SO}_3\text{M}$ ,  $-\text{C}_3\text{H}_6\text{SO}_3\text{M}$ ,  $-\text{P}(\text{O})(\text{OM})_2$ ,  $-\text{CH}_2-\text{COOM}$ , or  $-\text{C}_2\text{H}_4-\text{COOM}$ .

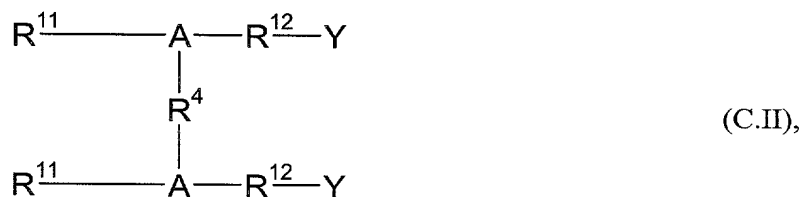
21. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (C.I),



wherein the substituents have the following meanings:

- R<sup>1</sup>** C<sub>5</sub>- to C<sub>25</sub>-alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated, hydroxy-substituted or perfluorinated;
- R<sup>2</sup>** C<sub>1</sub>- to C<sub>12</sub>-alkylene or hydroxy-substituted derivatives thereof;
- B** an amide group [-C(O)N(R<sup>2</sup>)- or -N(R<sup>5</sup>)C(O)-], a carboxyl group [-C(O)O- or -OC(O)-], a polyether group [-O(R<sup>6</sup>-O)<sub>x</sub>-];
- R<sup>5</sup>** C<sub>1</sub>- to C<sub>4</sub>-alkyl or hydroxy-substituted alkyl or H;
- R<sup>6</sup>** C<sub>2</sub>- to C<sub>4</sub>-alkylene;
- x** a number from 1 to 20;
- R<sup>3</sup>** C<sub>1</sub>- to C<sub>12</sub>-alkyl or hydroxy-substituted derivatives thereof, R<sup>7</sup>-D-R<sup>7</sup> or a polyether group [-O(R<sup>6</sup>-O)<sub>x</sub>-];
- R<sup>7</sup>** C<sub>1</sub>- to C<sub>6</sub>- alkylene or hydroxy-substituted derivatives thereof;
- D** -O-, -S-, -N(R<sup>8</sup>)-;
- R<sup>4</sup>** alkylene or alkylaryl having from 1 to 12 carbon atoms or the hydroxy-substituted derivatives or R<sup>9</sup>-D<sup>1</sup>-R<sup>9</sup>;
- R<sup>8</sup>** C<sub>1</sub>- to C<sub>12</sub>-alkyl or hydroxy-substituted alkyl or H or R<sup>9</sup>-D<sup>1</sup>-R<sup>9</sup>;
- R<sup>9</sup>** C<sub>1</sub>- to C<sub>6</sub>-alkylene or hydroxy-substituted derivatives thereof or aryl;
- D<sup>1</sup>** -O-, -S-, -SO<sub>2</sub>-, -C(O)-, [-O(R<sup>7</sup>-O)<sub>x</sub>-], (R<sup>10</sup>)<sub>i</sub>[N(R<sup>10</sup>)]<sub>z</sub>, or aryl;
- R<sup>10</sup>** C<sub>1</sub>- to C<sub>12</sub>-alkyl or hydroxy-substituted alkyl or H or aryl;
- t, z** are independently a number from 1 to 4, and
- Y** is independently -SO<sub>3</sub>H, O-SO<sub>3</sub>H, -OP(O)(OH)<sub>2</sub>, -P(O)(OH)<sub>2</sub>, -COOH, -CO<sub>2</sub>-C<sub>6</sub>H<sub>4</sub>-SO<sub>3</sub>H or the salts thereof.

22. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (C.II)



wherein the substituents have the meanings as defined by the general formula (C.I) of claim 21 and

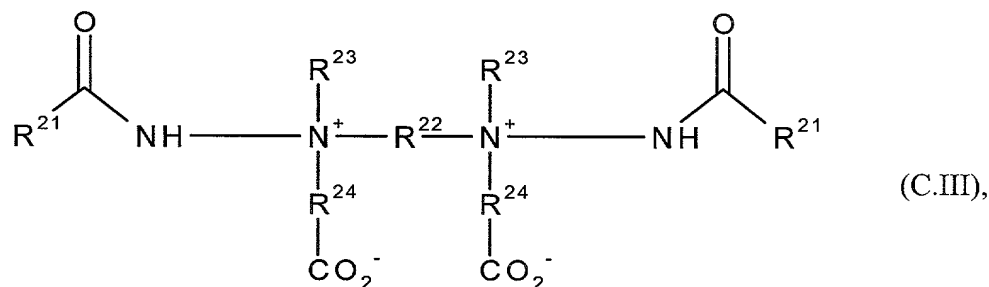
$R^{11}$  is  $C_5$ - to  $C_{23}$ -alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated, hydroxy-substituted or perfluorinated or  $R^{14}$ -B- $R^2$ ;

$R^{14}$  is  $C_1$ - to  $C_{12}$ -alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated, or the hydroxy-substituted derivatives;

$R^{12}$  means  $C_1$ - to  $C_{12}$ -alkylene, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated, or the hydroxy-substituted derivatives, or an amide group  $[-C(O)N(R^2)-$  or  $-N(R^5)C(O)-]$ , a carboxyl group  $[-C(O)O-$  or  $-OC(O)-]$ , a polyether group  $[-O(R^6-O)_x-]$  or  $R^9$ -D<sup>1</sup>- $R^9$  and

A is  $-CR^6=$  or  $-N=$ , if whenever A is equal to  $-N=$ ,  $R^{11}$  represents  $R^{14}$ -B- $R^2$ .

23. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (C.III)



wherein the substituents have the meanings as defined by the general formulas (C.I) and (C.II) and

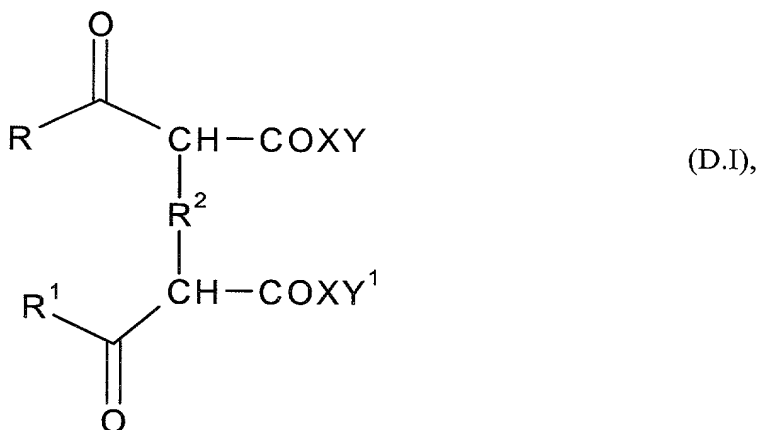
$R^{21}$  represents  $C_5$ - to  $C_{23}$ -alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated;

$R^{22}$ ,  $R^{24}$  are  $C_1$ - to  $C_6$ -alkylene and

$R^{23}$  is methyl, ethyl, propyl, or a polyether group  $[-O(R^6-O)_x-]$ .



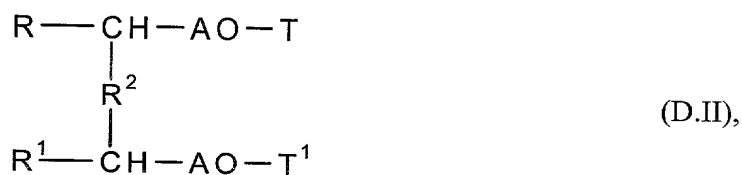
24. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (D.I)



wherein the substituents have the following meanings:

- R, R<sup>1</sup>** C<sub>5</sub>- to C<sub>30</sub>-alkyl, branched or unbranched, saturated, optionally as far as non-adjacently diunsaturated, hydroxy-substituted or perfluorinated;
- R<sup>2</sup>** C<sub>1</sub>- to C<sub>10</sub>-alkylene, arylene, or the hydroxy-substituted derivatives thereof, a polyether [-O(R<sup>4</sup>O)<sub>x</sub>-], -S-, -SO<sub>2</sub>-, -O-, -S-S-, -O-R<sup>5</sup>-O-, or -S-R<sup>5</sup>-S-; variable for a direct bond between the two α-carbons;
- R<sup>4</sup>** C<sub>2</sub>- to C<sub>4</sub>-alkylene;
- R<sup>5</sup>** C<sub>1</sub>- to C<sub>10</sub>-alkylene, arylene, or alkyl arylene, -N(R<sup>6</sup>)-, or -(NR<sup>6</sup>)-R<sup>7</sup>-(NR<sup>6</sup>)-;
- R<sup>6</sup>** C<sub>1</sub>- to C<sub>6</sub>-alkyl;
- R<sup>7</sup>** C<sub>1</sub>- to C<sub>6</sub>-alkyl, wherein R<sup>7</sup> and R<sup>6</sup> can also be part of a heterocyclic ring;
- X** polyether [-O(R<sup>4</sup>O)<sub>x</sub>-], wherein x is a number from 1 to 30, -O-, -NZ;
- Z** C<sub>1</sub>- to C<sub>10</sub>-alkyl, aryl, alkylaryl, or H, and
- Y, Y<sup>1</sup>** are independently H, -CH<sub>2</sub>-COOH and salts, a hydrocarbon radical having at least two hydroxyl groups, such as erythrose, threose, ribose, arabinose, xylose, fructose, lyxose, allose, altrose, glucose, mannose, galactose, and mixtures thereof.

25. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (D.II)



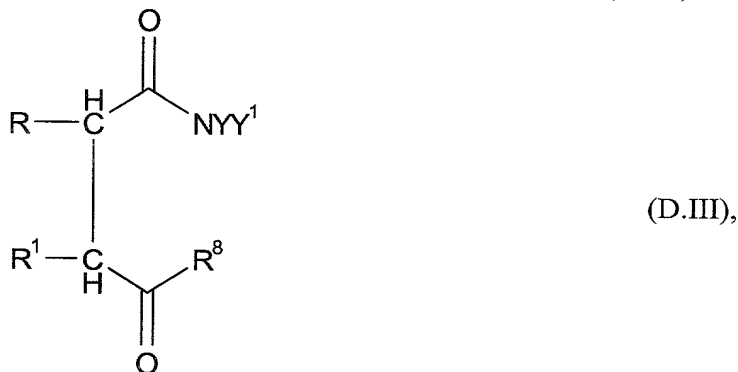
wherein the substituents have the meanings as defined by the general formula (D.I) of claim 24 and

**AO** means -C(O)-, -C(O)- [-O(R<sup>4</sup>O)<sub>x</sub>-], -CH<sub>2</sub>-[-O(R<sup>4</sup>O)<sub>x</sub>-], -CH<sub>2</sub>-O-;

**T, T<sup>1</sup>** are independently -OM, -H, -CH<sub>3</sub>, -C<sub>2</sub>H<sub>5</sub>, -SO<sub>3</sub>M, -CH<sub>2</sub>COOM, -C<sub>2</sub>H<sub>4</sub>-COOM, -C<sub>3</sub>H<sub>6</sub>-SO<sub>3</sub>M, -O-P(O)(OM)<sub>2</sub> and

**M** is alkyl,  $\frac{1}{2}$  alkaline earth, ammonium, mono-, di-, trialkanolammonium, or H.

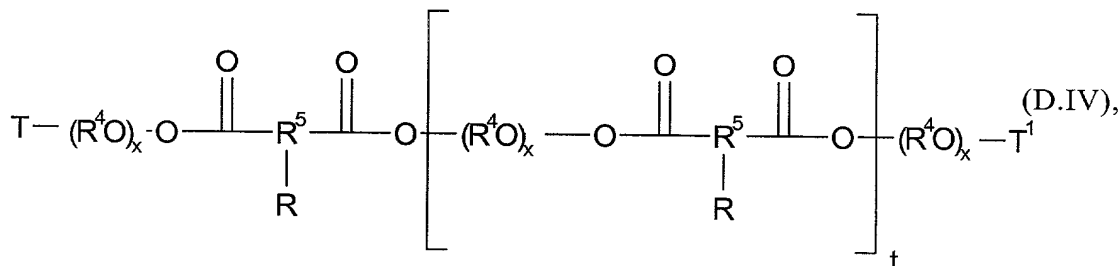
26. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (D.III)



wherein the substituents have the meanings as defined by the general formulas (D.I) of claim 24 and (D.II) of claim 25 and

**R<sup>8</sup>** represents NYY<sup>1</sup>, -O(R<sup>4</sup>O)<sub>x</sub>H or -O(R<sup>4</sup>O)<sub>x</sub>-C(O)-CHR-CHR<sup>1</sup>-C(O)NYY<sup>1</sup>.

27. A surfactant composition according to any one of claims 1 to 13, **characterized in that** the gemini surfactant has the general formula (D.IV)



wherein the substituents have the meanings as defined by the general formula (D.I) of claim 24, (D.II) of claim 25, and (D.III) of claim 26, and  $t$  is an integer from 1 to 100, preferably 1 to 20, most preferably 1 to 4.

- 5
28. A surfactant composition according to any one of claims 1 to 4, **characterized in that** the surfactant composition comprises a gemini surfactant of the general formula (AI) as component (A) and sulfosuccinate, acyllactylate, alkyl isethionates, betaines, and/or acylglutamates as component (B).
- 10
29. A surfactant composition according to any one of claims 1 to 4, **characterized in that** the surfactant composition comprises a gemini surfactant of the general formula (AIII) as component (A) and acyllactylates and/or acylglutamates as component (B).
- 5
30. A surfactant composition according to any one of claims 1 to 4, **characterized in that** the surfactant composition comprises a gemini surfactant of the general formula (CII) as component (A) and acyllactylates, acylglutamates, and/or alkyl isethionates as component (B).
- 10
31. A surfactant composition according to any one of claims 1 to 4, **characterized in that** the surfactant composition comprises a gemini surfactant of the general formula (DI) as component (A) and acyllactylates, acylglutamates, and/or alkyl isethionates as component (B).
- 25
32. A surfactant composition according to any one of claims 1 to 4, **characterized in that** the surfactant composition comprises a gemini surfactant of the general formula (DI) as component (A) and acyllactylates, acylglutamates, and/or alkyl isethionates as component (B).
- 30
33. The use of the surfactant composition as claimed in any one of the preceding claims as a constituent of skin and hair cleaning preparations.
- 35

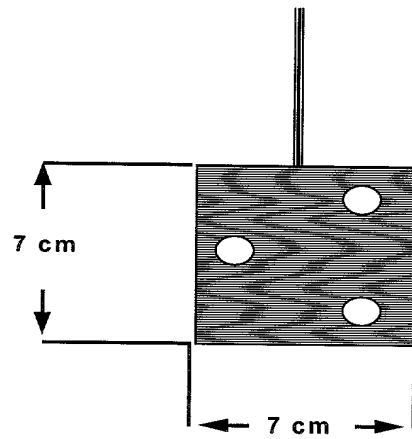
**Abstract**

The subject invention relates to a surfactant composition containing one or more gemini surfactant(s) and at least one different detergent component with mild, poor initial foaming characteristics. Furthermore, this invention relates to the use as a multifunctional cosmetic preparation for skin and hair cleaning and treatment formulations.

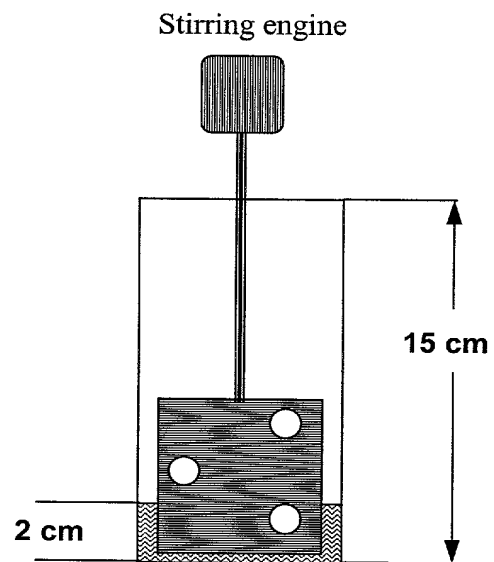
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**Fig. 1 / 3**

Vane stirrer for making foam

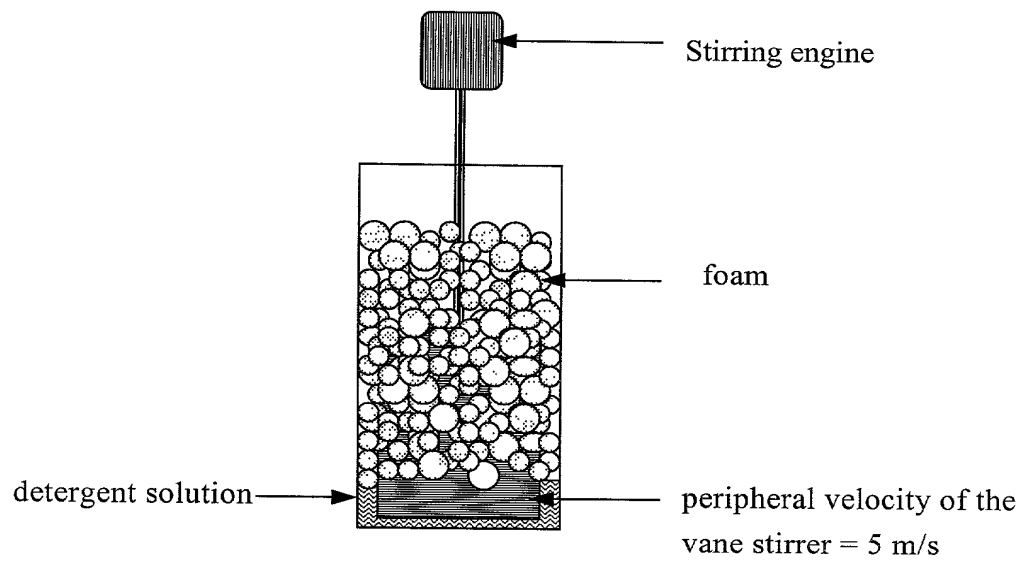
**Fig. 2 / 3**

Test apparatus for making foam



**Fig. 3 / 3**

Condition after foaming



Docket No.  
Muller-26

# Declaration and Power of Attorney For Patent Application

## English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

**Tenside Composition Containing Gemini Tensides and Use Thereof for Cleaning Skin and Hair**

the specification of which

(check one)

☐ is attached hereto.

☒ was filed on May 14, 2001 as United States Application No. or PCT International Application Number 09/831,797 and was amended on \_\_\_\_\_

(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority Not Claimed
<u>19943681.9</u>	<u>Germany</u>	<u>13 September 1999</u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	
<u>                    </u>	<u>                    </u>	<u>                    </u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	
<u>                    </u>	<u>                    </u>	<u>                    </u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

**PCT/DE00/03163**

**13 September 2000**

**pending**

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Status)  
(patented, pending, abandoned)

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(Application Serial No.)

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(Filing Date)

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(Status)  
(patented, pending, abandoned)

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Status)  
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

C. James Bushman, Reg. No. 24,810

Loren G. Helmreich, Reg. No. 29,389

Carlos A. Torres, Reg. 24,264

Marvin B. Eickenroht, Reg. No. 17,279

Eugene N. Riddle, Reg. 18,541

Send Correspondence to: C. James Bushman  
Browning Bushman  
5718 Westheimer, Suite 1800  
Houston, Texas 77057-5771

Direct Telephone Calls to: (name and telephone number)  
C. James Bushman, 713-266-5593

Full name of sole or first inventor

Klaus Kwetkat

Sole or first inventor's signature



Date

07-13-01

Residence

Bergkamen, Germany DEX

Citizenship

Germany

Post Office Address

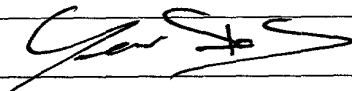
Germanenweg 5

D-59192 Bergkamen, Germany

Full name of second inventor, if any

Gerd H. Dahms

Second inventor's signature



Date

07-30-01

Residence

Duisburg, Germany DEX

Citizenship

Germany

Post Office Address

Koopmannstrasse 59a

D-47138 Duisburg, Germany